

3044

Evolution of the WNTI Uranium Concentrate Transport Good Practice

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Abstract

The World Nuclear Transport Institute (WNTI) has a long-standing Uranium Concentrate Working Group. This group has developed a first good practice which provides some methods for loading drums inside ISO containers for shipment by rail, road and sea.

A second good practice introduces and describes the checking of shipping containers from the consignor producer's facility to the consignee receiver's facility, and how they can be released into the open shipping world free of any contamination

Loading of uranium concentrate must conform to the IAEA standards and the Competent Authority regulation for the relevant countries.

Both of these industry good practice documents have been in the nuclear transport domain for many years and have been updated throughout where necessary.

The WNTI is in the process of consolidating the two good practice documents and other WNTI uranium concentrate guidance publications.

This paper will provide detailed information regarding the consolidated good practice document and its applicability to the transport of uranium concentrate and how it is being used within the industry.

Introduction

The World Nuclear Transport Institute was established in 1998 by the French reprocessing facility (COGEMA), British Nuclear Fuels Limited (BNFL), and the Federation of Electric Production Companies of Japan (FEPC) with its headquarters in London and sub offices in Tokyo and Washington. However through the 18 years, the WNTI has evolved into an institute that now embraces all the aspects of the transport of materials for the entire nuclear fuel cycle.

Even in the early years, it was also recognised that the unfettered supply of natural uranium ore concentrate was vital to the supply of carbon free, cost efficient, clean electricity to the power grids of the world.

In this regard, the WNTI set up a Uranium Concentrate Task Force (UCTF) in late 2005 to discuss the common transportation related interests of the commercial producers and converters of natural uranium ore concentrates. The UCTF also included transporters. As the need for the UCTF became permanent, the task force evolved into the Uranium Concentrate Working Group. The focus of the

working group is to discuss common means of meeting producers and converters tooling requirements, complying with the international transport regulations and guidelines [1,2,5] and making improvements in safety and efficient through pooling joint industry experiences. The working group discussed and explored the four main aspects of UOC shipping in shipping containers:

- i. the drums used for packaging;
- ii. the shipping containers themselves;
- iii. the restraint of the drums in the shipping containers; and
- iv. the release of empty shipping containers

Natural uranium ore concentrates are transported internationally by road, rail and sea from the uranium producers to uranium converters. Natural uranium ore concentrates are LSA-I material transported in Type IP-1 packaging, typically standard open-head steel drums. In some cases the transport takes place over relatively limited distances in dry vans (road trailers), however in many cases the transport is over long international routes that involve the use of dry 20' shipping (ISO) containers. International routes involve sea transport and often include both rail and road segments.

Generally the transport of natural uranium ore concentrate is sub-contracted to a specialised international transporter who will arrange for the transport from the mine/mill to the conversion plants. In many cases the international transporter will subcontract parts of the transport operation to other transport organisations. Although, drummed UOC has been safely and effectively transported for over fifty years, it was proposed that industry adopt a set of common standards to share information about industry good practices which can be adopted by all. This standard could also be adopted by new entries into the market.

WNTI Standard

Over the years the WNTI developed several information papers and best practice guidelines for the transport of natural uranium ore concentrate. The WNTI Standard, Good Practice Guide for Packaging and Transport of Uranium Concentrate, is a combination of four documents:

- Information Paper No.4 – Uranium Concentrates Industry Good Practices for ISO Containers in Multimodal Transport.
- Good Practice Guide GPG3 – Good Practice for the Securing of Drums of Uranium Ore Concentrate in 20' ISO Containers.
- Good Practice Guide GPG5 – WNTI Best Practice for Checking Shipping Containers Prior to Loading Drums of UOC and Before Dispatch.
- Information Paper No.6 – Uranium Concentrates Industry Best Practice for avoiding contamination of Packages and Shipping Containers in Multimodal Transports

The WNTI standard introduces and describes leading industry practice for the safe transport of natural

uranium ore concentrates. It is intended to share industry leading practices with other industry participants. It describes the practices that consignors should adopt in order to fulfil their obligations ensuring the security and safety of the communities and environments through which their UOC is transported. It should be read in conjunction with applicable national and international regulations for the safe transport of UOC.

The standard is divided into seven sections:

- Packaging
- Shipping containers
- Shipping container Loading
- Radiological monitoring and control of packaging and shipping containers
- Unpacking of shipping containers at consignee and converter premises
- Free release of shipping containers
- Response to incidents whilst transporting UOC

Packaging

UOC is typically packed in 205 litre steel drums with a gross weight of up to 450 kg. The drums must be suitable for repeated handling, stacking and storage for extended periods of time. They must have a removable top lid secured by a bolted retaining ring to allow for filling and emptying. Drums should have smooth internal and external surfaces to facilitate emptying and cleaning. Depending on their condition, empty drums are either recycled or disposed of after use.

Drum designs vary according to local availability and are subject to applicable national and international regulations. Converter contracts will typically include a drum specification, setting out precise details of construction, dimensions and markings. The standard further describes the drum body, lid, retaining ring and securing bolt.

Producers are encouraged to develop a close relationship with their drum suppliers, to monitor quality control and to set appropriate standards, including all required testing. Although not required by the regulations, testing is recommended and may include the suitability for stacking of drums up to a height of 3 m and a drop test from 0.8 m.

Shipping Containers

The transport of UOC drums typically utilizes ISO shipping containers [3]. Consignors either utilise shipping containers supplied by the relevant maritime shipping line carrier, enter into ‘one way’ equipment leasing arrangements through major global shipping container companies, or, in some cases, elect to provide and use their own equipment. There is a requirement for all consignors to comply with the ‘Convention for Safe Container’s (CSC’s) [4].

The WNTI standard encourages the producers to only use shipping containers supplied by a quality and reputable company and to also inspect the shipping containers prior to loading. The standard also provides recommended specification for the shipping container.

It is suggested that shipping containers be stowed under deck in the forward bay areas of the vessel. Consignors should work closely with their carriers who in turn should work closely with the Terminal Operators of the en route passage to achieve this outcome. However, some authorities may need to board the vessel to inspect the shipping containers prior to final approval for transit (e.g. Suez Canal) or berthing so this practice may not always be possible. Shipping containers should be stowed door to door, or alternatively with doors facing against steel bulkheads as this minimizes the risk for the doors opening should some external event trigger a significant impact or force on the shipping container.

Shipping Container Loading

Drums are loaded and secured in a shipping container in a variety of ways. Consignors should undertake a full and complete evaluation of the load restraining system, they intend to utilise to secure their drums or packages within shipping containers. The evaluation should ensure the restraining system is in full compliance with the applicable national and international standards.

The WNTI standard provides provisions for the loading design, such that drums should be restrained with dunnage and or lashing in compliance with the applicable transport regulations in order to prevent lateral and vertical movement during transport. Corded polyester (or equivalent) lashing is preferred, as it minimizes the need for dunnage disposal.

Wherever timber dunnage is used, it should be phytosanitary [6] compliant and free of defects which impair its strength or interferes with proper nailing.

Radiological Monitoring and Control of Packaging and Shipping Containers

Best practice requires that all packaging associated with radioactive materials be as clean as possible. Contaminants can be introduced onto packages and into shipping containers through exposure to the elements and through poor standards of housekeeping and associated work practices.

The WNTI Standard addresses methods for measuring contamination, monitoring of drums and shipping containers for contamination, pre-loading inspections of shipping containers, managing the shipping container loading area and loading of the shipping containers.

Although not a regulation, the WNTI recommends that consignors adopt the 0.4Bq/cm² value as the applicable standard for all relevant work areas and mobile equipment used when loading drums into

shipping containers (effectively reducing the admissible value for a package surface by a factor 10). This will help to ensure that the shipping containers are free of any possible contamination before leaving the consignor's premises as well as assisting to facilitate the free release of the empty shipping containers by the consignee or converter.

Unpacking of Shipping Containers at Consignee or Converter Premises

The standard describes the best practice to perform a receipt inspection, methods to control contamination when unloading the drums and the proper equipment to use to unload and handle drums.

Free release of Shipping Containers

Typically shipping containers are returned to a container yard location agreed between the consignor and the shipping container owner, empty and certified as being free from contamination by the consignee or by the converter, "Free Released". Free release as uncontaminated, the shipping container shall be checked and certified by the consignee or by the converter as having levels of fixed plus non-fixed contamination totaling less than 0.4 Bq/cm².

The WNTI Standard outlines the best practices for free releasing a shipping container.

Response to Incidents Whilst Transporting UOC

Consignors should have in place clear procedures to manage any incident during transport of shipping containers. Such procedures should take into account the different modes of transport and relevant host country requirements. Carriers and transport agents play an important role in managing incidents; therefore, a close collaboration must be maintained and plans must be exercised and vetted in advance.

When selecting transport providers, consignors should pay close attention to the incident response capabilities of those prospective carriers and transport agents and during the tenure of their relationship, undertake regular reviews and updates.

The WNTI standard provides a description of an Incident Response Action Plan.

Conclusions

The transportation of UOC is a global undertaking, as producers deliver their product on behalf of their customers, to converters utilizing supply chain routes traversing international waters, ports, shipping container terminals, public roads and railways. Current regulations for the transport of uranium concentrates are adequate and well understood by the industry. Nonetheless, it is important for well-established as well as new entities, to apply the common set of standards to ensure the safe and effective transport of natural uranium ore concentrate. With this aim, WNTI developed a standard that was written in plain language, easy to understand, adopt and based on best practices.

It is important for the industry to embrace a common standard and recognise that we should all act in the best interests of the industry.

There are encouraging signs of the significance of the WNTI Standard which is now seen as part of contracts between producers and converters.

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